DOCUMENT RESUME

ED 104 055 95 EC 071 655

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TITLE	The Universality of Self-Generated Verbal Mediators as a Means of Enhancing Memory Processes. Research Report No. 58.
INSTITUTION	Minnesota Univ., Minneapolis. Research, Development, and Demonstration Center in Education of Handicapped Children.
SPONS AGENCY	Bureau of Education for the Handicapped (DHEW/OE), Washington, D.C.
PUB DATE	Jan 74
GRANT	OEG-0-9-332189-4533(032)
NOTE	59p.
EDRS PRICE	MF-$0.76 HC-$3.32 PLUS POSTAGE
DESCRIPTORS	Cross Cultural Studies; Exceptional Child Research; Foreign Countries; *General Education; Kindergarten; Language Research; *Language Role; Memory; *Paired Associate Learning; *Recall (Psychological)
IDENTIFIERS	*Israel

ABSTRACT

In a replication of a similar study with American children, 56 normal native Israeli children (5-years-old) were studied to determine the universality of self-generated verbal mediators as a means of enhancing memory processes. Eight Ss, randomly selected, were assigned in each of the following conditions: labeling, sentence generation, listening to interrogative reversals or why questions, response to interrogative reversals, sentence repetition, response to what questions, or response to why questions. Ss were presented with 21 pairs of pictures of common objects under the designated conditions, and were then shown only one picture from each pair and asked to identify the missing picture. Results revealed the mean number of correct responses was highest (16.1) to the "response to why questions" and was lowest (1.5) in the "labeling" condition. Findings replicated those of the study with American children in that the conditions that enhanced a higher recall were the conditions that required the child to generate a verbal mediator that would meaningfully encompass both paired associates items. (Instructions and formats for each testing condition are appended.) (LS)

ED104055

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RESEARCH REPORT #58

Project No. 332189
Grant No. OE-332189-4533 (032)

THE UNIVERSALITY OF SELF-GENERATED VERBAL MEDIATORS AS A MEANS OF ENHANCING MEMORY PROCESSES

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Research, Development and Demonstration
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Minneapolis, Minnesota

January 1974

Department of Health, Education and Welfare
U. S. Office of Education
Bureau of Education for the Handicapped

TECHNICAL REPORTS

University of Minnesota Research, Development and Demonstration
Center in Education of Handicapped Children

(Place of publication shown in parentheses where applicable)

1. N. Buium & J. Turnure. The universality of self-generated verbal mediators as a means of enhancing memory processes. Research Report #58. January 1974.

2. D. Moores, K. Weiss, & M. Goodwin. Evaluation of programs for hearing impaired children: Report of 1972-73. Research Report #57. December 1973.

3. J. Turnure, W. Charlesworth, D. Moores, J. Rynders, M. Horrobin, S. Samuels & R. Wozniak. American Psychological Association Symposium Papers. Occasional Paper #24. December 1973.

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Center in Education of Handicapped Children
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The research reported herein was performed pursuant to a grant from the Office of International Programs Developmental Funds Grant, the University of Minnesota, and by a grant to the University of Minnesota Research, Development and Demonstration Center in Education of Handicapped Children from the Bureau of Education of the Handicapped, U. S. Office of Education. Contractors undertaking such projects under government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official position of the Bureau of Education for the Handicapped.

Department of Health, Education and Welfare
U. S. Office of Education
Bureau of Education for the Handicapped

RESEARCH AND DEVELOPMENT CENTER
IN EDUCATION OF HANDICAPPED CHILDREN
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The University of Minnesota Research, Development and Demonstration Center in Education of Handicapped Children has been established to concentrate on intervention strategies and materials which develop and improve language and communication skills in young handicapped children.

The long term objective of the Center is to improve the language and communication abilities of handicapped children by means of identification of linguistically and potentially linguistically handicapped children, development and evaluation of intervention strategies with young handicapped children and dissemination of findings and products of benefit to young handicapped children.

Acknowledgement

The authors would like to extend their appreciations to the kindergarten teachers in the central region of Israel (Holon and Tel-Aviv) who were not only unintimidated by our 3-weeks-crash-program of data collection, but also helped us conclude the study in time. We would also like to extend our thanks to the office of Culture and Education of the Holon Municipal Authorities for their help in selecting the appropriate kindergartens.

Special thanks go to Dr. William E. Wright and Mrs. Virginia C. Rengel from the Office of International Programs who need be credited in getting this project off the ground.

This research was supported by funds from the Office of International Programs Developmental Funds Grant, the University of Minnesota, and by a grant to the University of Minnesota Research, Development and Demonstration Center in Education of Handicapped Children (OEG-09-332189-4533-032) from the Bureau of Education of the Handicapped, U.S. Office of Education.

The Universality of Self-Generated Verbal Mediators As A Means of Enhancing Memory Processes

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Jenkins (1973) has suggested the primary organization of memory to be semantic, thus favoring semantic or meaningful encoding over the encoding of syntax or form. The activation of semantic memory is a function of the cognitive activity of the child with respect to the given materials. When these materials are subjected to semantic analysis they are well recalled whether the child is trying to learn them or not. Semantic analysis appears to be best insured when the child is given an active role in the mediation process. Bobrow and Bower (1969) found that recognition of the meaningfulness of two items was more certain to take place when the subject himself generated the mediating sentence. The ability to generate effective mediators was noted by Rohwer (1973), Martin (1967) and MacMillan (1970) to be age dependent: children younger than six years of age were not found to benefit from a "self generating" condition to the extent that older children did.

Turnure, Buium & Thurlow (1974) have found that children younger than six years of age were able, under appropriate instructions, to produce effective verbal mediators thus enhancing their recall of the paired associates. (see the Turnure, et al study for a complete discussion on the production deficiency model).

The Turnure, et al study was conducted in the Minneapolis - St. Paul, Minnesota Public School System using the English language as the verbal mediators' "building blocks" as produced by children reared in the American culture. The writers were intrigued by the possibility that the various conditions (techniques) that were found to be effective in the Turnure,et al study as means of enhancing memory processes could be used with a similar degree of success by children reared in a different culture (Israel) and spoke a different language (Hebrew). Although it appeared to us that the kind of tasks required of the children in the Turnure,et al study were cognitive in nature and language free, such valid arguments as Bruner's (1966), Deese's (1970), Slobin's (1971) and others regarding the impact of culture and environment on the semantic organization of language,have modified our question into an empirical one.

We set out to investigate (1) whether the same conditions that induced the children in the Turnure, et al study to recall a high number of correct responses, would induce Israeli children of a similar age whose only language is Hebrew to recall as many correct responses and (2) what is the nature and extent of the semantic analysis induced by each condition among the Israeli children? This might be accomplished by close observation of the incorrect responses in each condition. It is conceivable that the kinds of errors the child does make might reflect parts of the system he uses to encode or decode a given relation between two paired-associate items. More specifically, it is intended to search for errors of a semantic or non-semantic nature.

Outside these experimental questions there is an additional motivating force for this research: If the findings would suggest similarities between Israeli and American children's performance on the given experimental conditions, it might encourage Israeli psychologists to adopt certain verbal behavior research methods that are carried out in this country.

METHOD

Subjects: Fifty-six normal children, 5 years of age, were randomly selected for this study from 10 kindergartens located in the central region of Israel.

All the children were natives of Israel whose parents had been in Israel for at least 18 years. The language spoken at home is Hebrew. All families came from the middle socio-economic level of the Israeli population, as estimated by the Office of Culture and Education, Holon's Municipal Authorities.

Conditions: Eight children, randomly selected were assigned in each of the following conditions:

(1) Labeling
(2) Sentence generation
(3) Listening to interrogative reversals or why questions.
(4) Response to interrogative reversals
(5) Sentence repetition
(6) Response to what questions
(7) Response to why questions

Materials: Forty-two color pictures of common objects from a pre-primer workbook were used as the stimulus materials. From these 42 pictures, 21 pairs were formed with no common or obvious relationship of meaning existing between the members of any pairs. Items were chosen in order to construct semantic categories either of the stimuli or the response items. Seven such categories were constructed including: (1) clothing (2) furniture (3) tools (4) footwear (5) water animals (6) land animals and (7) containers.

Semantic Categories

Clothing (Response item)

1. Doll - Hat
2. Carrots - Mittens
3. Soap - Jacket

Furniture (Response item)

4. Comb - Bed
5. Wagon - Table
6. Ball - Chair

Water animals (Stimulus item)

7. Turtle - House
8. Fish - Book
9. Duck - Toaster

Tools (Response item)

10. Telephone - shovel
11. Candle - Saw
12. Pie - Hammer

Footwear (Response item)

13. Wheel - Boots
14. Tent - Socks
15. Light - Shoes

Animals (Stimulus item)

16. Monkey - Kite
17. Cat - Gun
18. Dog - Clock

Containers (Response item)

19. Gate - Box
20. Bell - Basket
21. Boat - Cup

Error Classification:

A. Semantic errors

Type I errors within experimental categories: these errors consisted of non-correct responses that were included in the predetermined semantic category of the stimulus or response item. Example: Box instead of basket.

Type II errors due to the child's categorizations: These errors consisted of non-correct responses that (1) were within

the list of items presented to the child (2) were outside the experimentally intended semantic categories of the stimulus or response items. (3) a meaningful relation was observed between the two items to suggest that they may belong to an experimentally unintended semantic category. Example: Candle linked to Light (lightings category).

Type III errors characterized by an association: these errors consisted of non-correct responses that (1) were outside the list of items presented to the child (2) had a high probablistic value that they would be associated with the stimulus item. Example: Rabbit associated with carrots.

B. Non-semantic errors

Type IV non-semantic errors: these errors consisted of non-correct responses that did not lend themselves to any interpetable meaningful relation. Example: Book instead of socks.

C. No responses

Type V no responses: these consisted of the events in which the child failed to name any response item.

Procedure: Each child was tested individually. (see Appendix for instructions and formats for each condition). At first the child went through a pretraining phase whose purpose was to insure that the experimental instructions were clearly understood. Following was the training phase in which according to the conditions, the child

was presented with both pictorial items and asked to respond in some way to the instructions (an exception, of course, was the listening condition). Then the child was presented with the actual test in a standard paired-associate anticipation format, in which he was shown only one picture of the pairs and asked to identify the picture that "goes with it."

Data collection: Two basic measures were obtained in this study: (1) The correct response (the child recalled the "missing" pictorial item of the paired associates) and the incorrect response (the child failed to recall the exact "missing" pictorial item: he responded with a different item or did not respond at all) in the various conditions. (2) The frequency of the various semantic and non-semantic errors as well as the no responses of the child in the various conditions.

Results

Table I and Figure I present the mean correct responses and their percentage in each condition. Table I should be read as follows:

Table I and Figure I about here

The mean correct responses in the labeling condition were 1.5 out of the 21 possible responses (7 percent of all responses).

Table II presents the total non-correct responses in each condition; the frequency and percent of the semantic errors, the frequency and percent of the non-semantic errors, and the frequency and percent of the non-responses of the total non-correct responses. Table II should be read as follows: There were a total of 150 non-correct responses in the labeling condition. Of these 156, 12,or 8 percent, of all non-correct responses were semantic errors, 54 or 35 percent of all non-correct responses were non-semantic errors, and 90 or 58 percent were non-responses.

Table II about here

Table III presents the frequency and percent of each semantic error type from the total non-correct responses in each condition.

Table III about here

Table III should be read as follows: In the labeling condition 9 errors or 5.7 percent of all non-correct responses were found to be of Type 1; 3 errors or 2 percent of all non-correct responses of Type II, and zero percent of all non-correct responses were found to be of Type III.

Figure II describes the percent of all correct responses from the total possible responses; the percent of the semantic errors from all non-correct responses and the percent of the non-correct responses from all possible responses.

Figure II about here

One way analysis of variance revealed that the conditions effect was significant ($F = 38.87$; $df = 6,49$; $p < .001$).

Further analyses were done by means of Newman-Keuls Test. The significant differences are shown in Table IV.

Table IV about here

DISCUSSION

Comparing the data of Table 1 or Figure 1 from Israeli children with data obtained in the American (Turnure, Buium and Thurlow, 1974) study revealed a marked similarity: In both studies, the same set of conditions induced superior recall, and the ranking of the conditions according to their correct response scores was identical in both studies.

The seven conditions differ in the extent to which they present the child with a meaningful relation between the two paired associates and induce him to respond to this meaningfulness. From a semantic based (Jenkins, 1973) organization of memory model, the following observations are suggested regarding these conditions: (1) The labeling condition imposes no semantic relation between the paired associates and does not induce the child to search for one. Thus one would not expect this condition to produce high correct recall. The mean of the children's correct responses in this condition was 1.5 out of 21 possible responses. (2) The Sentence Generation condition requires the child to "make up a sentence" regarding the two paired associates. As with the American children in the Turnure, et al, study, the Israeli children also responded with conjunctiye structures (the pie and the hammer; see also Rohwer, 1973) or with the identification of the functions of each of the items (the pie is to eat and the hammer to work). In either kind of response the extent of semantic integration between the items was minimal and the low recall scores were anticipated (see the Turnure, et al, study for a complete discussion on the production deficiency model). (3) The third condition (listening) was designed

to be somewhat analagous to some of the verbal input the child receives from the teacher in the classroom. There is some evidence that teachers often present their pupils with a variety of interrogative reversal type questions or WH type questions without giving the child an opportunity to respond (Turnure and Thurlow, 1973). We investigated the extent to which merely listening to an interrogative induces the child to integrate (semantically) the material. Thus, four of the children listened to interrogative reversals and four to Why questions. The results indicate a somewhat higher recall score than the previous two conditions, suggesting a higher amount of semantic integration. However, inspection of Table I or Figure I reveals that the performance of the children in listening to interrogatives is inferior to listening and responding to interrogatives.

Obviously (Table I or Figure I), not all "response to interrogative" conditions enhances the correct recall to the same extent. Responding to interrogative reversals with a yes or no produced a mean of 6.3 correct responses whereas responding to What or Why questions produced a mean of 14.6 and 16.1 correct responses respectively. It is conceivable, from a semantic based organization of memory model, to suggest that the necessity of formulating a verbal response to a Why or What question had induced the child to integrate (semantically) the paired associates: The extent of the semantic integration is reflected in the higher recall scores of these two conditions. Perhaps a lesser amount of semantic integration is necessary to respond appropriately to a "forced choice" interrogative reversal; thus the lower score of correct recall.

The Sentence Repetition condition is unique in the sense that it provides the child with a semantic relation between the two paired associates, yet the child's repetition of the mediator may or may not reflect semantic integration on his part. It is conceivable that the young child may be able to repeat the sentence (syntactically) and yet fail to grasp the intended meaning, which might lead to his failing to encode the information according to its semantic components for future recall. Such a child might have been at a lesser disadvantage had he been involved in constructing the relation in a way that was meaningful to him. Previous studies of Sentence Repetition in paired associates (Turnure and Thurlow, 1973) tend to support this view.

Inspection of Table II and Figure II reveals that as the total correct response scores increase across conditions (and the total non-correct responses decrease), the percent of semantic errors increases across the same conditions. This trend appears to be meaningful from a semantic based organization of memory model: For the child to have scored high on correct recall, he must have been exposed to a condition that induced him to perform semantic analysis; thus, a large proportion of any remaining errors must have also been of a semantic nature. The extent of semantic errors in each condition might reflect the extent of semantic analysis induced upon the child by each condition. The semantic errors are further subdivided into three groups (TAble III). It is of some interest that the extent of the semantic errors under Type I category exceeds that of Type II, which in turn exceeds those of Type III in all experimental conditions. This may suggest that the experimentally designed semantic categories accounted for most of the

errors, followed by the semantic errors arising out of the experimentally unintended semantic categories. The smallest group of semantic errors was accounted for by associations.

Observations of Table II suggest the extent of non-semantic errors follows a trend: the higher the correct recall appears to be, the lower is the percent of non-semantic errors of that condition. This seems to be in accord with the semantic based organization of memory. The one exception is the Sentence Repetition condition in which one finds a higher percent of non-semantic errors in relation to the total correct responses. Perhaps, this may suggest a non-semantic strategy followed by the child in encoding some of the relations of this condition. This is in accord with our earlier observations regarding this condition.

A lesser definite trend is portrayed by the no-response scores. Generally, its percent (of the total incorrect response) remains stable in all conditions except response to Why and What where it sharply declines.

As noted earlier, the conditions that enhanced a higher recall were the conditions that required the child to generate a verbal mediator that would meaningfully encompass both paired associates items. This would appear to be one of the most direct indicators of the manner in which language may facilitate the memory aspect of cognition. Thus, we may use the measure of recall (the final product) as an indicator of the extent to which two languages differ as facilitators of memory under similar conditions: If two languages differ in their semantic organization due to some environmental and cultural imprints, this

difference may be reflected in differing recall scores. However, we have found the recall scores and the semantic errors of the Israeli children to be very similar to those of the American children. It needs to be pointed out that a major cross-cultural variable that acts to reduce differences in children's cognitive performances is suggested by Bruner (1966) to be formal schooling instruction. It appears that we have bypassed the impact of this factor by testing five years olds. Thus, we were actually testing whether the cognitive performance of the American children who generated verbal mediators reflecting specific linguistic and cultural imprints could be replicated by the Israeli children who generated verbal mediators reflecting different linguistic and cultural imprints. The similarity in the performance of the two groups with respect to the total correct responses and the semantic errors suggests the task involved to be of a cognitive-universal nature as far as these two cultures are concerned, where different languages and their imprints do not differentially affect the children's cognitive performance.

One major consequence of this finding is the apparent green light "go signal" to Israeli psychologists to use the findings of the various language based memory enhancement techniques developed in America with their own subjects, thus benefiting from the many years of experience in developing verbal behavior programs in the United States.

It seems that psychologists from other cultures and languages may benefit to the same extent from these language coded memory enhancement techniques. Further investigations into their use in other languages are suggested.

In conclusion, the findings of the present study have replicated the Turnure, Buium and Thurlow study in the following aspects: (1) Response to Why and What questions have resulted in the highest recall scores. (2) The higher recall scores were consistently associated with a higher percent of semantic errors, implicating semantic processing in the preceding findings.

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Table I

The mean and % of the correct responses
in each of the conditions.

Condition	$\bar{X}$ of correct responses	% of correct responses
1. Labeling	1.5	7.
2. Sentence Generation	2.1	10
3. Listening	5.4	26
4. Response Yes-No	6.3	30
5. Sentence Repetition	7.7	37
6. Response What	14.6	70
7. Response Why	16.1	80

Table II

The total non-correct responses in each condition, the frequency and percent of semantic errors, non-semantic errors and non-responses of all non-correct responses.

Condition	Non-correct responses	Sem. ER.		Non-sen. ER.		non-resp.	
		FR.	%	Fr.	%	Fr.	%
Labeling	156	12	8	54	35	90	58
Sent. Gen.	151	15	10	41	27	95	63
Listen	125	15	12	26	21	84	67
Resp. Yes-No	117	24	21	13	11	80	68
Sent. Rep.	105	27	26	34	32	45	42
Resp. What	52	26	50	10	21	15	29
Resp. Why	39	23	59	5	13	11	28

Table III

The frequency and percent of each semantic error type from the total non-correct responses for each condition.

Condition	Semantic Errors					
	ER. Typ. I		ER. Typ. II		ER. Type III.	
	Fr.	%	Fr.	%	Fr.	%
Labeling	9	5.7	3	2.0	0	0
Sent. Gen.	6	4.	5	3.3	4	2.6
Listen.	9	7.2	4	3.2	2	1.6
Resp. Yes-No	11	9.4	8	7.	5	4.
Sent. Rep.	10	9.5	9	8.6	8	7.6
Resp. what	12	23	11	21	3	5.8
Resp. why	13	33.	8	21.	2	5.

Table IV

Newman - Keuls Test

Table of mean difference.

	Labeling	Sentence Generation	Listening	Resp. Yes-No	Sentence Repetition	Resp. What	Resp. Why
Labeling	-			*	*	*	*
Sentence Generation		-			*	*	*
Listening			-			*	*
Response Yes-No				-			*
Sentence Repetition					-		
Response What						-	
Response Why							-

*p < .01

Figure I The mean of correct responses in each condition.

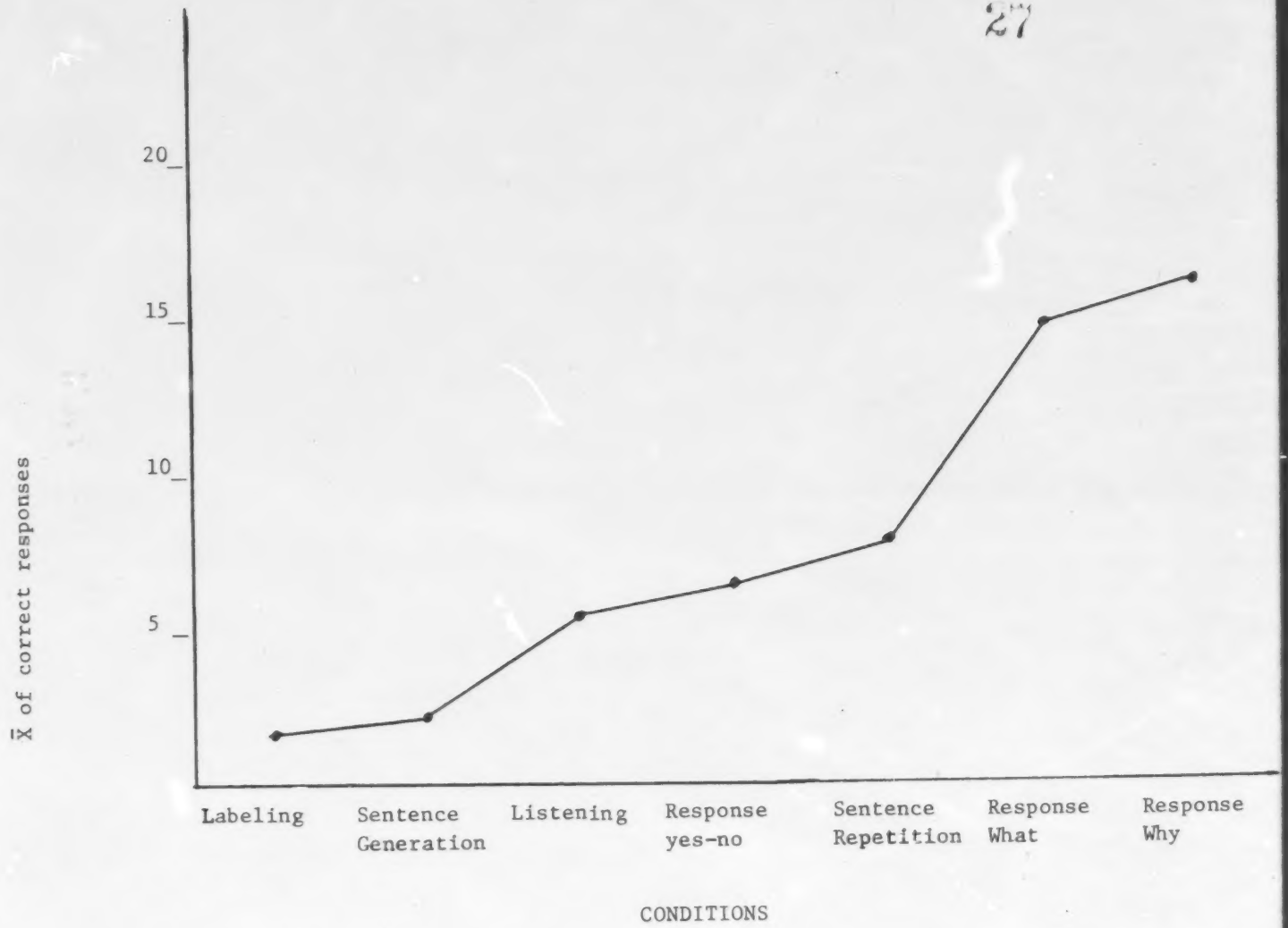
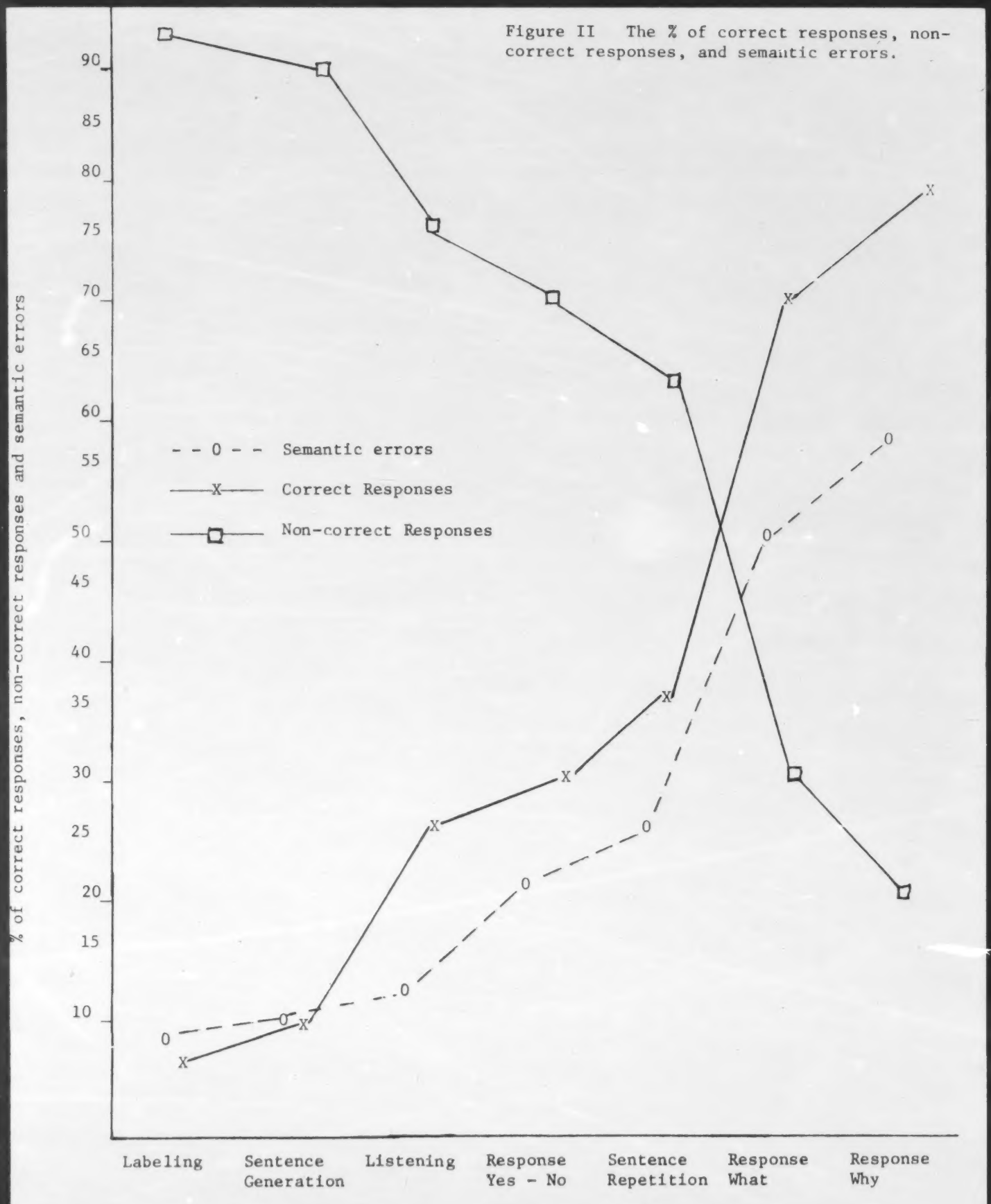


Figure II The % of correct responses, non-correct responses, and semantic errors.



APPENDIX A

INSTRUCTIONS

LABELING CONDITION

PRE-TRAINING: Hi! Today we are going to look at some pictures. I will show you two pictures together and I will say something about them. I want you to say exactly the same thing after me. Okay? Let's try it with these pictures.

15 sec/pair with pictures

+ 15 sec, if needed

(Present pictures to child, name them, and have the child repeat the labels twice).

1. Leaf - Tree
2. Key - Door
3. Pig - Barn

ACQUISITION TRAINING: Good! Now I am going to put these away. But, I have a lot more pictures, and I want you to keep doing the same thing. Each time I show you two pictures together, listen to what I say, then you say the same thing after me. Okay? Are you ready?

15 sec/pair with pictures

+ 15 sec, if needed

(Present pictures to child, name them, and have the child repeat the labels twice).

1. Carrots - Mittens
2. Turtle - House
3. Telephone - Shovel
4. Comb - Bed
5. Bell - Basket
6. Boat - Cup
7. Dog - Clock
8. Cat - Gun
9. Wagon - Table
10. Pie - Hammer
11. Monkey - Kite
12. Tent - Socks
13. Ball - Chair
14. Candle - Saw
15. Gate - Box
16. Duck - Toaster
17. Doll - Hat
18. Light - Shoes
19. Broom - Jacket
20. Wheel - Boots
21. Fish - Book

TEST TRIAL: Very good! Now, I want to try something a little different. This time, I am going to show you just one of the pictures you saw before, and I want you to tell me what picture goes with it. I want you to tell me the name of the picture I am hiding behind the one I show you. Okay? Let's try it.

20 sec/pair

(Present stimulus pictures to child and wait for the child to respond).

(After a response is given, or 20 seconds are up, briefly show the child the two pictures together, and go on to the next pair).

SENTENCE GENERATION CONDITION

PRE-TRAINING: Hi! Today we are going to look at some pictures. I will show you two pictures together and I want you to tell me something about them. I want you to try to make up a sentence about the two pictures. Okay? Let's try it with these pictures.

15 sec/pair with pictures

(Present pictures to child and allow him to make up a sentence about each pair).

+ 15 sec, if needed

1. Leaf - Tree
2. Key - Door
3. Pig - Barn

(If child has any trouble making up a sentence, continue probing for sentence, but do not ask a question while doing so).

ACQUISITION TRAINING: Good! Now, I am going to put these away. But, I have a lot more pictures, and I want you to keep doing the same thing. Each time I show you two pictures together, you make up a sentence about the two pictures and tell it to me. Okay? Are you ready?

5 sec/pair with pictures

(Present pictures to child and allow him to make up a sentence about each pair. Follow the same prompting procedures described above, if necessary).

+ 15 sec, if needed

TEST TRIAL: Very good! Now, I want to try something a little different. This time, I am going to show you just one of the pictures you saw before, and I want you to tell me what picture goes with it. I want you to tell me the name of the picture I am hiding behind the one I show you. Okay? Let's try it.

20 sec/pair

(Present stimulus pictures to child and wait for the child to respond).

(After a response is given, or 20 seconds are up, briefly show the child the two pictures together, and go on to the next pair).

INSTRUCTIONS

LISTENING TO YES-NO QUESTIONS
CONDITION (INTERROGATIVE REVERSALS)

PRE-TRAINING: Hi! Today we are going to look at some pictures. I will show you two pictures together and I will ask a question about them. I want you to listen to the question and say nothing. Okay? Let's try it with these pictures.

15 sec/pair with pictures + 15 sec, if needed

(Present each picture-pair to child, and say the following question:

1. Is the leaf falling off the tree?
2. Is the key opening the door?
3. Is the pig walking into the barn?

ACQUISITION TRAINING: Good! Now I'm going to put these away. But, I have a lot more pictures, and I want you to keep doing the same thing. Each time I show you two pictures together, listen to my question. Okay? Are you ready?

(Present each pair of pictures to the child, and ask the appropriate question).

1. Are the carrots in the mittens?
2. Is the turtle crawling into the house?
3. Is the telephone falling on the shoval?
4. Is the comb on the bed?
5. Is the bell in the basket?
6. Is the boat floating in the cup?
7. Is the dog barking at the clock?
8. Is the cat jumping on the gun?
9. Is the wagon rolling toward the table?
10. Is the pie by the hammer?
11. Is the monkey running after the kite?
12. Is the tent full of socks?
13. Is the ball bouncing on the chair?
14. Is the candle melting on the saw?
15. Is the gate falling in the box?
16. Is the duck looking into the toaster?
17. Is the doll wearing a hat?
18. Is the light on the shoes?
19. Is the soap under the jacket?
20. Is the wheel rolling across the boats?
21. Is the fish reading a book?

TEST TRIAL: Very good! Now, I want to try something a little different. This time, I am going to show you just one of the pictures you saw before, and I want you to tell me what picture goes with it. I want you to tell me the name of the picture I am hiding behind the one I show you. Okay? Let's try it.

20 sec/pair

(Present stimulus pictures to child and wait for the child to respond).

(After a response is given, or 20 seconds are up, briefly show the child the two pictures together, and go on to the next pair).

INSTRUCTIONS

LISTENING TO WHY QUESTIONS CONDITION

PRE-TRAINING: Hi! Today we are going to look at some pictures. I will show you two pictures together and I will ask you a question about them. I want you to listen to my question about the two pictures and say nothing. Okay? Let's try it with these pictures.

(Present each picture-pair to child, ask the appropriate question, and have the child listen to the question).

15 sec/pair with pictures + 15 sec, if needed

1. Why is the leaf falling off the tree?
2. Why is the key by the door?
3. Why is the pig walking into the barn?

ACQUISITION TRAINING: Good! Now I am going to put these away. But, I have a lot more pictures, and I want you to keep doing the same thing. Each time I show you two pictures together, I will ask you a question, and you listen to my question and say nothing. Okay? Are you ready?

15 sec/pair with pictures + 15 sec, if needed

(Present each pair of pictures to child, ask the appropriate question).

1. Why are the carrots in the mittens?
2. Why is the turtle crawling into the house?
3. Why is the telephone falling on the shovel?
4. Why is the comb on the bed?
5. Why is the bell in the basket?
6. Why is the boat floating in the cup?
7. Why is the dog barking at the clock?
8. Why is the cat jumping on the gun?
9. Why is the wagon rolling toward the table?
10. Why is the pie by the hammer?
11. Why is the monkey running after the kite?
12. Why is the tent full of socks?
13. Why is the ball bouncing on the chair?
14. Why is the candle melting on the saw?
15. Why is the gate falling in the box?
16. Why is the duck looking into the toaster?
17. Why is the doll wearing the hat?
18. Why is the light on the shoes?
19. Why is the soap under the jacket?
20. Why is the wheel rolling across the boots?
21. Why is the fish reading a book?

TEST TRIAL: Very good! Now, I want to try something a little different. This time, I am going to show you just one of the pictures you saw before, and I want you to tell me what picture goes with it. I want you to tell me the name of the picture I am hiding behind the one I show you. Okay? Let's try it.

20 sec/pair

(Present stimulus pictures to child and wait for the child to respond).

(After a response is given, or 20 seconds are up, briefly show the child the two pictures together, and go on to the next pair).

INSTRUCTIONS

YES - NO QUESTION CONDITION

PRE-TRAINING: Hi! Today we are going to look at some pictures. I will show you two pictures together and I will ask you a question about them. I want you to answer my question about the two pictures. Okay? Let's try it with these pictures.

15 sec/pair with pictures
+ 15 sec, if needed

(Present each picture-pair to child, ask the appropriate question, and have the child answer the question).

1. Is the leaf falling off the tree?
2. Is the key opening the door?
3. Is the pig walking into the barn?

(If the child has trouble answering any question, use the following sequence of prompts:
a. "Do you think...." [repeat question ending]?
b. Continue probing with only questions asked being in Yes-No form.

ACQUISITION TRAINING: Good! Now I am going to put these away. But, I have a lot more pictures, and I want you to keep doing the same thing. Each time I show you two pictures together, I will ask you a question, and then you should answer my question. Okay? Are you ready?

5 sec/pair with pictures
15 sec, if needed

(Present each pair of pictures to child, ask the appropriate question, and have the child answer the question. If prompting is necessary, follow the same procedures described above).

1. Are there carrots in the mittens?
2. Is the turtle crawling into the house?
3. Is the telephone falling on the shovel?
4. Is the comb on the bed?
5. Is the bell in the basket?

6. Is the boat floating in the cup?
7. Is the dog barking at the clock?
8. Is the cat jumping on the gun?
9. Is the wagon rolling toward the table?
10. Is the pie by the hammer?
11. Is the monkey running after the kite?
12. Is the tent full of socks?
13. Is the ball bouncing on the chair?
14. Is the candle melting on the saw?
15. Is the gate falling in the box?
16. Is the duck looking into the toaster?
17. Is the doll wearing the hat?
18. Is the light on the shoes?
19. Is the soap under the jacket?
20. Is the wheel rolling across the boots?
21. Is the fish reading the book?

TEST TRIAL: Very good! Now, I want to try something a little different. This time, I am going to show you just one of the pictures you saw before, and I want you to tell me what picture goes with it. I want you to tell me the name of the picture I am hiding behind the one I show you. Okay? Let's try it.

20 sec/pair

(Present stimulus pictures to child and wait for the child to respond).

(After a response is given, or 20 seconds are up, briefly show the child the two pictures together, and go on to the next pair).

INSTRUCTIONS

SENTENCE REPETITION CONDITION

PRE-TRAINING: Hi! Today we are going to look at some pictures. I will show you two pictures together and I will say something about them. I want you to say exactly the same thing after me. Okay? Let's try it with these pictures.

15 sec/pair with pictures + 15 sec, if needed

(Present each picture-pair to child, say the following sentence, and have the child repeat the sentence after you).

1. The leaf is falling off the tree.
2. The key is opening the door.
3. The pig is walking into the barn.

ACQUISITION TRAINING: Good! Now I am going to put these away. But, I have a lot more pictures, and I want you to keep doing the same thing. Each time I show you two pictures together, listen to what I say, then you say the same thing after me. Okay? Are you ready?

15 sec/pair with pictures + 15 sec, if needed

(Present each pair of pictures to child, say the following sentence, and have the child repeat the sentence after you).

1. There are carrots in the mittens.
2. The turtle is crawling into the house.
3. The telephone is falling on the shovel.
4. The comb is on the bed.
5. The bell is in the basket.
6. The boat is floating in the cup.
7. The dog is barking at the clock.
8. The cat is jumping on the gun.
9. The wagon is rolling toward the table.
10. The pie is by the hammer.
11. The monkey is running after the kite.
12. The tent is full of socks.
13. The ball is bouncing on the chair.
14. The candle is melting on the saw.
15. The gate is falling in the box.
16. The duck is looking into the toaster.
17. The doll is wearing the hat.
18. The light is on the shoes.
19. The soap is under the jacket.
20. The wheel is rolling across the boots.
21. The fish is reading a book.

TEST TRIAL: Very good! Now, I want to try something a little different. This time, I am going to show you just one of the pictures you saw before, and I want you to tell me what picture goes with it. I want you to tell me the name of the picture I am hiding behind the one I show you. Okay? Let's try it.

20 sec/pair

(Present stimulus pictures to child and wait for the child to respond).

(After a response is given, or 20 seconds are up, briefly show the child the two pictures together, and go on to the next pair).

INSTRUCTIONS

WHAT QUESTION CONDITION

PRE-TRAINING: Hi! Today we are going to look at some pictures. I will show you two pictures together and I will ask you a question about them. I want you to answer my question about the two pictures. Okay? Let's try it with these pictures.

15 sec/pair with pictures

15 sec, if needed

(Present each picture-pair to child, ask the appropriate question, and have the child answer the question).

1. What is the leaf doing to the tree?
2. What is the key doing to the door?
3. What is the pig doing in the barn?

(If the child has trouble answering any question:
a. "What do you think the...."[repeat of question ending]?
b. "Try to tell me what...."[repeat of question ending]?
c. Continue probing with only questions asked being in the What form.

ACQUISITION TRAINING: Good! Now I am going to put these away. But, I have a lot more pictures, and I want you to keep doing the same thing. Each time I show you two pictures together, I will ask you a question, and then you should answer my question. Okay? Are you ready?

15 sec/pair with pictures

+ 15 sec, if needed

(Present each pair of pictures to child, ask the appropriate question, and have the child answer the question. If prompting is necessary, follow the same procedures described above).

1. What are the carrots doing in the mittens?
2. What is the turtle doing to the house?
3. What is the telephone doing on the shovel?
4. What is the comb doing on the bed?
5. What is the bell doing in the basket?

6. What is the boat doing in the cup?
7. What is the dog doing to the clock?
8. What is the cat doing to the gun?
9. What is the wagon doing by the table?
10. What is the pie doing by the hammer?
11. What is the monkey doing to the kite?
12. What is the tent doing to the socks?
13. What is the ball doing on the chair?
14. What is the candle doing on the saw?
15. What is the gate doing in the box?
16. What is the duck doing to the toaster?
17. What is the doll doing to the hat?
18. What is the light doing to the shoes?
19. What is the soap doing under the jacket?
20. What is the wheel doing to the boots?
21. What is the fish doing to the book?

TEST TRIAL: Very good! Now, I want to try something a little different. This time, I am going to show you just one of the pictures you saw before, and I want you to tell me what picture goes with it. I want you to tell me the name of the picture I am hiding behind the one I show you. Okay? Let's try it.

15 sec/pair

(Present stimulus pictures to child and wait for the child to respond).

(After a response is given, or 20 seconds are up, briefly show the child the two pictures together, and go on to the next pair).

INSTRUCTIONS

WHY QUESTION CONDITION

PRE-TRAINING: Hi! Today we are going to look at some pictures. I will show you two pictures together and I will ask you a question about them. I want you to answer my question about the two pictures. Okay? Let's try it with these pictures.

15 sec/pair with pictures
15 sec, if needed

(Present each picture-pair to child, ask the appropriate question, and have the child answer the question).

1. Why is the leaf falling off the tree?
2. Why is the key by the door?
3. Why is the pig walking into the barn?

(If the child has trouble answering any question, use the following sequence of prompts:
a. "Why do you think...."[repeat of question ending]?
b. "Try to tell me a story about why...."[repeat of question ending]?
c. Continue probing with only questions asked being in the Why form.

ACQUISITION TRAINING: Good! Now I am going to put these away. But, I have a lot more pictures, and I want you to keep doing the same thing. Each time I show you two pictures together, I will ask you a question, and then you should answer my question. Okay? Are you ready?

15 sec/pair with pictures
15 sec, if needed

(Present each pair of pictures to child, ask the appropriate question, and have the child answer the question. If prompting is necessary, follow the same procedures described above).

1. Why are the carrots in the mittens?
2. Why is the turtle crawling into the house?
3. Why is the telephone falling on the shovel?
4. Why is the comb on the bed?
5. Why is the bell in the basket?

6. Why is the boat floating in the cup?
7. Why is the dog barking at the clock?
8. Why is the cat jumping on the gun?
9. Why is the wagon rolling toward the table?
10. Why is the pie by the hammer?
11. Why is the monkey running after the kite?
12. Why is the tent full of socks?
13. Why is the ball bouncing on the chair?
14. Why is the candle melting on the saw?
15. Why is the gate falling in the box?
16. Why is the duck looking into the toaster?
17. Why is the doll wearing the hat?
18. Why is the light on the shoes?
19. Why is the soap under the jacket?
20. Why is the wheel rolling across the boots?
21. Why is the fish reading a book?

TEST TRIAL: Very good! Now, I want to try something a little different. This time, I am going to show you just one of the pictures you saw before, and I want you to tell me what picture goes with it. I want you to tell me the name of the picture I am hiding behind the one I show you. Okay? Let's try it.

20 sec/pair

(Present stimulus pictures to child and wait for the child to respond).

(After a response is given, or 20 seconds are up, briefly show the child the two pictures together, and go on to the next pair).

APPENDIX B

LABELING

CONDITION

Subjects	Sex	Age	Total Correct	ER I	ER II	ER III	ER IV	ER V
Subject No. 1	M	5.0	0	1	0	0	3	17
Subject No. 2	M	5.0	4	1	0	0	4	12
Subject No. 3.	M	5.0	1	3	1	0	9	7
Subject No. 4	F	5.0	2	0	1	0	3	15
Subject No. 5	M	5.0	0	0	0	0	[illegible]	16
Subject No. 6	M	5.0	0	1	0	0	17	3
Subject No. 7	M	5.0	2	1	1	0	5	12
Subject No. 8	M	5.0	3	2	0	0	8	8
TOTAL			12	9	3	0	54	90
MEAN			1.5					

Total Semantic Errors 12

Total Non-Sem. Errors 54

Total No Responses 90

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SENTENCE GENERATION

CONDITION

Subjects	Sex	Age	Total Correct		ER I	ER II	ER III	ER IV	ER V
Subject No. 1	M	5.0	4		0	1	0	11	5
Subject No. 2	F	5.0	2		0	0	0	2	17
Subject No. 3	M	5.0	2		2	1	1	5	10
Subject No. 4	F	5.0	2		0	1	1	7	10
Subject No. 5	F	5.0	2		0	0	0	1	18
Subject No. 6	M	5.0	3		4	0	2	6	6
Subject No. 7	M	5.0	1		0	1	0	4	15
Subject No. 8	F	5.0	1		0	1	0	5	14
TOTAL			17		6	5	4	41	95
MEAN			2.1						

Total Semantic Errors 15

Total Non-Sem. Errors 41

Total No Responses 95

LISTEN TO WHY / YES-NO CONDITIONS

Subjects	Sex	Age	Total Correct		ER I	ER II	ER III	ER IV	ER V	
Subject No. 1	M	5.0	4		0	1	0	1	15	
Subject No. 2	M	5.0	9		0	0	1	11	0	WHY CONDITION
Subject No. 3	F	5.5	7		0	0	0	1	13	
Subject No. 4	F	5.0	4		4	0	0	3	10	
Subject No. 5	M	5.0	8		1	3	1	3	5	YES-NO CONDITION
Subject No. 6	F	5.0	5		0	0	0	1	15	
Subject No. 7	F	5.0	6		3	0	0	6	6	
Subject No. 8	M	5.0	0		1	0	0	0	20	
TOTAL			43		9	4	2	26	84	
MEAN			5.4							

Total Semantic Errors 15

Total Non-Sem. Errors 26

Total No Responses 84

RESPONSE TO YES-NO

CONDITION

Subjects	Sex	Age	Total Correct		ER I	ER II	ER III	ER IV	ER V
Subject No. 1	M	5.0	5		1	2	0	0	13
Subject No. 2	M	5.0	6		3	2	0	1	9
Subject No. 3	M	5.0	9		0	0	2	0	10
Subject No. 4	M	5.0	7		0	0	0	2	12
Subject No. 5	F	5.0	5		2	1	0	3	10
Subject No. 6	M	5.0	7		1	0	0	6	7
Subject No. 7	M	5.0	6		2	2	1	1	9
Subject No. 8	F	5.0	6		2	1	2	0	10
TOTAL			51		11	8	5	13	80
MEAN			6.3						

Total Semantic Errors 24

Total Non-Sem. Errors 13

Total No Responses 80

SENTENCE REPETITION

CONDITION

Subjects	Sex	Age	Total Correct		ER I	ER II	ER III	ER IV	ER V
Subject No. 1	M	5.0	8		2	0	0	2	9
Subject No. 2	M	5.0	12		2	1	0	4	1
Subject No. 3	M	5.0	3		1	1	1	1	14
Subject No. 4	F	5.0	10		1	1	0	2	7
Subject No. 5	M	5.0	10		1	2	4	4	0
Subject No. 6	M	5.0	3		2	3	2	11	0
Subject No. 7	M	5.0	12		1	1	0	4	3
Subject No. 8	F	5.0	4		0	0	1	6	11
TOTAL			62		10	9	8	34	45
MEAN			7.7						

Total Semantic Errors 27

Total Non-Sem. Errors 34

Total No Responses 45

RESPONSE TO WHAT

CONDITION

Subjects	Sex	Age	Total Correct		ER I	ER II	ER III	ER IV	ER V
Subject No. 1	M	5.0	20		0	1	0	0	0
Subject No. 2	M	5.0	12		3	3	2	2	0
Subject No. 3	F	5.0	19		0	1	0	1	0
Subject No. 4	M	5.0	10		2	2	0	3	3
Subject No. 5	F	5.0	10		4	3	0	2	2
Subject No. 6	M	5.0	13		1	0	1	2	4
Subject No. 7	M	5.0	19		0	1	0	0	1
Subject No. 8	F	5.0	14		2	0	0	0	5
TOTAL			117		12	11	3	10	15
MEAN			14.6						

Total Semantic Errors 26

Total Non-Sem. Errors 10

Total No Responses 15

RESPONSE TO WHY

CONDITION

Subjects	Sex	Age	Total Correct		ER I	ER II	ER III	ER IV	ER V
Subject No. 1	M	5.5	16		1	1	0	0	3
Subject No. 2	M	5.0	15		2	1	0	0	3
Subject No. 3	M	5.0	16		2	3	0	0	0
Subject No. 4	M	5.0	15		2	2	0	1	1
Subject No. 5	F	5.0	16		2	0	2	1	0
Subject No. 6	F	5.5	15		1	1	0	2	2
Subject No. 7	M	4.5	17		2	0	0	1	1
Subject No. 8	F	5.0	19		1	0	0	0	1
TOTAL			129		13	8	2	5	11
MEAN			16.1						

Total Semantic Errors	23
Total Non-Sem. Errors	5
Total No Responses	11

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